UAVSAR: Flight Planning in the Cloud

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Flight planning for NASA/JPL's Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) is currently a time-consuming task for both principal investigators (PIs) and UAVSAR members. UAVSAR is an airborne repeat-pass L-band polarimetric radar developed by JPL as an imaging radar testbed for future spaceborne missions [Rosen, et al.]. We are developing an intuitive, interactive web-based application that will make flight planning and time estimation an easier task for PIs and for JPL.

Currently, to request data, a PI must contact the UAVSAR science coordinator, who manually records all the information associated with the desired flight lines – particularly the specific latitudes and longitudes – compiles all the lines into a comprehensive flight plan, and then runs the flight planning software [Chapman, et al.] which generates the radar control files and the flight plan files for the airplane pilots. As an added challenge to an already lengthy process, PIs frequently require their flight lines to be slightly adjusted: for example, laterally nudge a line a few hundred meters from the original position. In order to do this, the science coordinator must recalculate the latitudes and longitudes, reassemble the full flight plan, and rerun the flight planning software to generate the necessary files for the actual flights.

Another tedious task associated with flight planning is flight time estimation. Again, this cannot be easily determined without first compiling the entire flight plan and then calculating the estimated time.

To help alleviate the challenges of flight planning and time estimation, we are developing an interactive application [Figure 1] that can run through a web browser. This new interface will enable PIs, as well as UAVSAR members, to do their own flight planning and time estimation without having to request flight lines through the science

coordinator. The application will enable users to see their own flight plan being constructed interactively through a map interface and then the flight planning software will generate all the files necessary for the flights. Afterward, the UAVSAR team can then complete the flight request, including calendaring and putting everything in the expected format for processing by NASA's airborne science program.
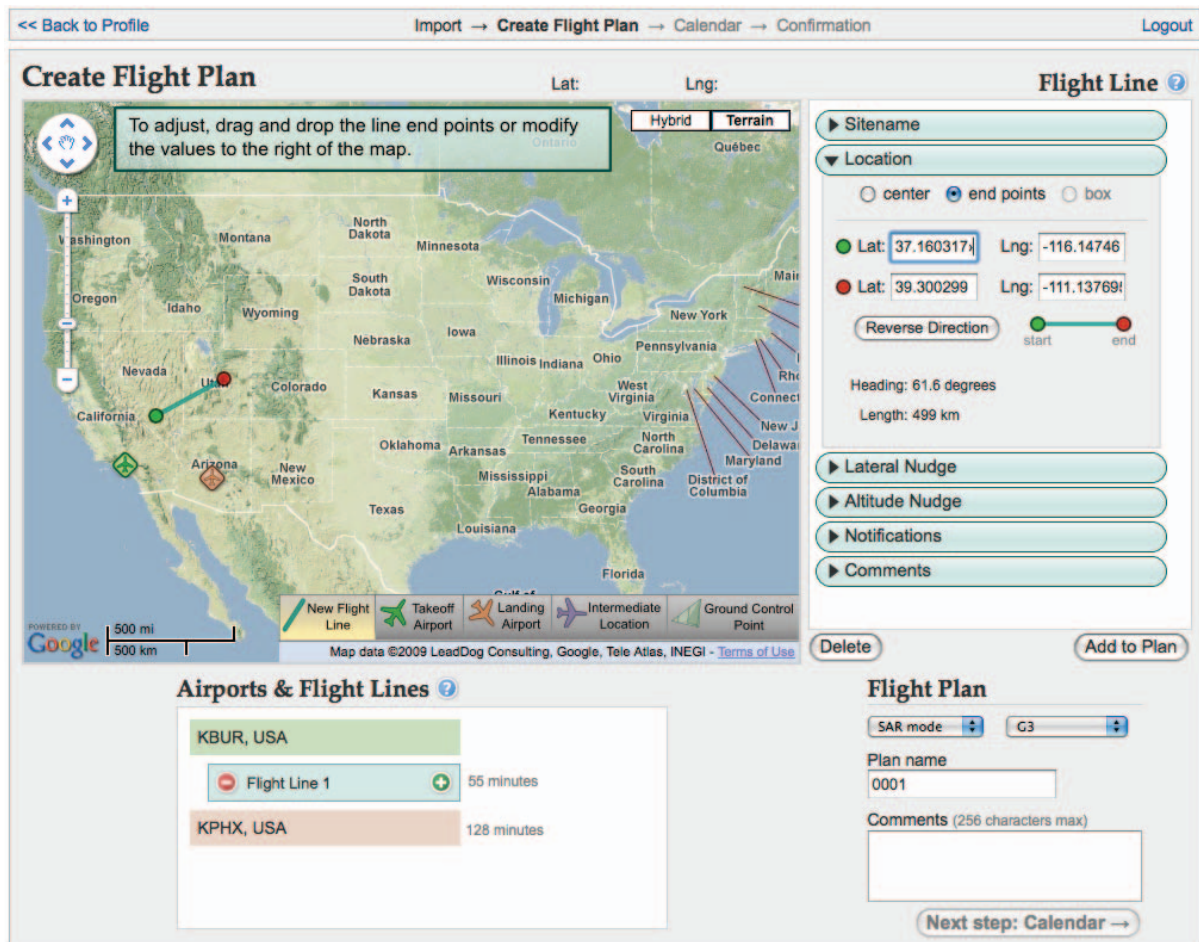

Figure 1. Screenshot of the new UAVSAR flight planning interface

The flight planning application is implemented with various software technologies: SQL to access the UAVSAR database, Perl for server-side scripting and making SQL queries, HTML and CSS to format the web interface, Javascript to handle all user interactions with the interface, and the Google Maps API to handle all user interactions with the map. We are also using a technique called AJAX, which enables access to the database without having to refresh the page; this is crucial to making a responsive, interactive interface.

Some of the main features of the interface include drawing flight lines on the map, nudging them, adding them to the current flight plan, and reordering them. The user can also search and select takeoff, landing, and intermediate airports. As the flight plan is constructed, all of its components are constantly being saved to the database and the estimated flight times are updated. Another advantageous feature is the ability to import flight lines from previous saved flight plans.

One of the main motivations was to make this web application as simple and intuitive as possible, while also being dynamic and robust. This interactive interface will make flight planning an easier process for everyone involved, especially as more features are implemented in the future.

References

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